

## METHODS FOR IDENTIFYING DIVERSIFICATION TYPES OF REGIONAL ECONOMIES OF EU COUNTRIES

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### Methods for Identifying Diversification Types of Regional Economies of EU Countries

*In accordance with the purpose of the study, taking into account the results of the analysis of existing scientific work by Ukrainian and foreign authors, the need to consider the diversification process as partially managed to ensure the possibility of predicting a certain level of diversification at the state level and understanding what diversification paths exist and which of them will be acceptable for Ukraine, a typology of regions by the level of diversification and an approach to assessing its current level have been developed. The proposed method was tested using data from individual EU countries. The typology provides for four types of spatial development in terms of types of economic activity: highly concentrated economy ("Fish skeleton"), medium-concentrated economy ("School of fish"), medium-diversified economy ("Core"), and highly diversified economy ("Network"). Advantages and risks are determined for each type. Identification of types of regions was carried out on the basis of the following indicators: Herfindahl-Hirschman index, relative concentration index, and regional and sectoral concentration coefficient. The analysis of the spatial development of Poland, Romania, the Czech Republic and France in 2022 by the employment component as the most indicative in terms of the development of individual types of economic activity in regions at the NUTS 2 level allowed us to identify the types of regions in each country. For the most part, the regions belonged to either the medium-concentrated or medium-diversified types. The highly diversified type mainly included metropolitan regions due to the developed service sector, in particular, information and computer services, while they are characterized by a lower than average level of employment in the manufacturing industry. Highly concentrated regional economies are mainly focused on the mining industry due to the distribution of resources, as well as on the manufacturing industry. The first type is more vulnerable to fluctuations in world markets. It is concluded that the inclusion in the consideration of an enlarged type of economic activity, which includes agriculture, as well as the detailing of industry, especially manufacturing, by its subsectors, will allow expanding the possibilities of determining the types of regions at the next stages of the study. One of the directions of further research is the analysis of the dependencies between the types of diversification and macro indicators. To determine the types of regions of countries in terms of the level of diversification of their economies, the coefficient of regional and sectoral concentration was calculated.*

**Keywords:** diversification; spatial development; regions; typology; identification methods; types of diversification.

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### Полякова О. Ю., Шликова В. О. Методи ідентифікації типів диверсифікації регіональних економік країн ЄС

Відповідно до поставленої мети дослідження, з урахуванням результатів аналізу наявного наукового доробку українських і зарубіжних авторів, необхідності розглядати процес диверсифікації як частково керований для забезпечення можливості прогнозування певного рівня диверсифікації на рівні держави та розуміння того, які шляхи диверсифікації існують і які з них будуть прийнятними для України, розроблено типологію регіонів за рівнем диверсифікації та підхід до оцінки її поточного рівня. Запропонований метод апробовано на основі даних окремих країн ЄС. Типологія передбачає чотири типи просторового розвитку у вимірі видів економічної діяльності: висококонцентрована економіка («Риб'ячий скелет»), середньоконцентрована економіка («Косяк риби»), середньодиверсифікована економіка («Ядро»), високодиверсифікована економіка («Мережа»). Для кожного типу визначено переваги та ризики. Ідентифікація типів регіонів здійснювалася на основі таких показників: індекс Герфіндала-Гіршмана, індекс відносної концентрації, коефіцієнт регіональної та секторальної концентрації. Аналіз просторового розвитку Польщі, Румунії, Чехії і Франції у 2022 р. за компонентом зайнятості як найбільш показової з точки зору розвитку окремих видів економічної діяльності у регіонах на рівні NUTS 2 дозволив ідентифікувати типи регіонів у кожній країні. Здебільшого регіони відносилися або до середньоконцентрованого, або до середньодиверсифікованого типів. До високодиверсифікованого типу здебільшого відносилися столичні регіони за рахунок розвинутого сектора послуг, зокрема,

інформаційних і комп'ютерних, водночас для них характерна нижча за середній рівень по країні рівень зайнятості у переробній промисловості. Висококонцентровані регіональні економіки переважно зосереджені на гірничодобувній промисловості через розподіл ресурсів, а також на переробній промисловості. Перший тип більш вразливий до коливань світових ринків. Зроблено висновок про те, що включення до розгляду укрупненого типу економічної діяльності, який охоплює сільське господарство, а також деталізація промисловості, особливо переробної, за її підсекторами дозволить розширити можливості визначення типів регіонів на наступних етапах дослідження. Одним із напрямків подальших досліджень є аналіз залежностей між типами диверсифікації та макропоказниками.

**Ключові слова:** диверсифікація; просторовий розвиток; регіони; типологізація; методи ідентифікації; типи диверсифікації.

**Рис.: 5. Табл.: 6. Бібл.: 20.**

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**Introduction.** Diversification remains a relevant topic for Ukraine, as in wartime conditions, determining its level and capabilities for ensuring resilience becomes of particular importance. The regions of Ukraine are fundamentally very different, and during the war, the differentiation intensified [1-4]. Therefore, the question arises of how diversified the economy of each region and between regions is. It is important to determine what diversification option should be in order for the socio-economic system of the region to be the least vulnerable and most resilient. The results of the analysis of existing studies have shown that it is the diversification of spatial development, its degree and type that are practically not used as a criterion for typology for countries or regions. The closest thing to the analysis of spatial development from the point of view of diversification is the allocation in EU documents of a separate type of monofunctional cities, the characteristic feature of which is dependence on one sector (type of economic activity) [5]. In addition, if the typology is based on the analysis of uniformity/unevenness, equality/inequality of income, living conditions, access to resources, then we can talk about taking into account the components of social diversification [5].

Considerable attention of scientists remains focused on the diversification process and its varieties such as related and unrelated [6-16]. In particular, Barbero J. and co-authors [9] investigate the role of related technological diversification in the economic development of European regions, for which they use the indicator of related technological diversification in combination with a stochastic assessment of its boundaries and a general equilibrium model. The importance of relatedness and economic complexity for sectoral and technological diversification in Brazilian regions is explored in the work Françoso M. S. and co-authors [10]. In the study [12], Alshamsi A. and co-authors model strategic diversification and propose an algorithm for determining the types of activities that are optimal for target use at each point in time. Boschma R. in his work [14] based on an analysis of the literature, outlines a number of relevant issues for future research, in particular, the isolation of different types of opportunities that force regions to diversify, focusing on the impact of the specifics

of territorial institutional aspects, the study of factors that determine related and unrelated diversification, and micro-perspectives of regional diversification. Within the concept of smart specialization, Piirainen K. and co-authors [15] proposed a typology of four models of smart specialization: diversification, transition, radical basis and modernization. These models are based on different ways of achieving smart specialization, based on two driving forces – the existence of an additional industry and the position regarding the main type of activity of the region. That is, diversification is considered as one of the options, while we consider it necessary for any region. In another work, Boschma R. and co-authors [16] developed a theoretical framework for regional diversification by integrating the concept of evolutionary economic geography and studies of transition periods (industrial, institutional, technological changes). A typology of four trajectories of regional diversification is proposed – replication and exaptation (refer to related diversification), transplantation and saltation (refer to unrelated diversification) with an emphasis on the role of agents in the processes of institutional entrepreneurship. Replication means the most conservative logic of diversification, in which the region develops related industries by introducing technology that is institutionalized in the global socio-technical regime. In this logic of diversification, the region largely reproduces its existing capability base by expanding it into related activities, and at the same time largely reproduces the existing knowledge, institutions, and interests embedded in the existing socio-technical regime. Transplantation refers to a diversification trajectory in which the region develops an industry unrelated to its knowledge base and institutions, but based on the adoption of the regime's technology from the global system. This logic of diversification is riskier because the region cannot rely on its existing knowledge base and regional institutions while it has to compete with many other regions where the regime is already in place. This strategy can only be successful if it exploits resources other than knowledge and institutions, such as location, connectivity, a critical natural resource, or low labor costs. Exaptation refers to a diversification logic where new applications are discovered

for existing knowledge or technology. In turn, the concept of saltation leading to a new niche refers to innovation that is new not only to the region but also to the world. The author notes that four different logics of diversification will have implications for the design and implementation of public policy.

We want to consider the diversification process as partially managed to ensure the possibility of predicting a certain level of diversification at the state level, while in existing studies it is considered to be largely unmanaged. The current study is aimed at understanding what diversification paths exist and which ones will be acceptable for Ukraine.

**The purpose of the study** is to develop typology and approach to assess the existing level of diversification according to the typology, and test it using data from individual EU countries.

**Methodology.** We view “diversification of spatial development” as a process of expanding and distributing all types of assets, resources and activities of the country’s territories to ensure stable socio-economic development of territorial entities, creating conditions for ensuring their self-sufficiency and self-development, increasing the efficiency of using regional resources, and eliminating regional disparities. In short, we consider diversification a means of stabilisation, reducing the economy’s vulnerability [17].

Thus, for further analysis and determination of directions of spatial development, there was a need to develop a typology based on the concept of diversification of spatial development of the country, regions. The typology of spatial development of the country, regions within the economic component is based on a combination of two dimensions of diversification – industry and geography. The sectoral dimension covers the economy of a country or region and is determined by the types of economic (and industrial) activity that are present in the country, region. The geographical dimension reflects the distribution of existing types of economic activity by regions of the country, communities in the region (territory).

Analysis of the results of the assessment of the diversification of the regions of Ukraine allows us to identify four main types of spatial development, which differ in terms of the degree of sectoral-spatial concentration/diversification of the country’s economy [5]. In no case is it impossible to develop only one sector, since in any structure of the economy, systems of life support for the population, provision of public (state) services, social security, etc. must function. The classification should mainly take into account diversification within the real sector and \business services.

To study the distribution and concentration of economic activities among regions, the indicator of the number of employed persons by regions of Poland, Romania, France and the Czech Republic at the NUTS 2 level of the Nomenclature of Territorial Units of the European Union (threshold values of population from 800 thousand to 3 million) was chosen as the main indicator at this stage. This indicator is considered key for conducting structural analysis of the economy and regional specialization [18]. The choice of countries for analysis is due to the presence of common features with Ukraine for use in further comparative studies, in particular, the presence of a historical heritage of a planned economy (Poland, Romania, the Czech Republic), a comparable population size (Poland) and area (France).

The analysis was carried out for 16 aggregated economic activities (Sections “B” to “N” and “P” to “Q” of the NACE Rev. 2 Classification of Economic Activities), based on the availability of data in the Eurostat statistical database of the European Commission [19]. The structural business statistics data in the regional breakdown do not cover agriculture, forestry and fishing (Section A) and public administration and defence (Section O).

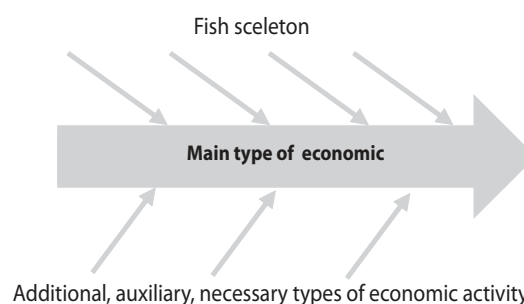
Year 2022 was chosen as the main time period, for which the most complete information is available in the statistical database by region and type of economic activity.

**Results.** During the study, we identified the following types of spatial development in the sectoral dimension:

1. A highly concentrated economy of a country (region) is characterized by the development of one leading type of economic activity, in which assets, investments, workplaces and employment, innovations are concentrated, and the corresponding enterprises provide the lion’s share of revenues to budgets of all levels. The remaining types of economic activity present in the country (region) perform supporting functions, that is, provide services to the population, as well as the necessary minimum services to enterprises. Schematically, this type of spatial development is shown in Fig. 1. The conditional name “Fish skeleton” emphasizes that one type is actually developing, and the rest are additional, auxiliary, and the corresponding enterprises exist only in the volume necessary for this type and, accordingly, the population (households) employed in this type.

Products (goods, products) of one type of economic activity are exported both outside the region and outside the country. Employment opportunities for the population are limited, both in terms of volume and in terms of professional skills.

This type is one pole of the typology and can be found in its pure form in a few cases. For example, island countries (regions), small countries or regions with specific conditions and natural resources may belong to this type.



**Fig. 1. Scheme of spatial development of a highly concentrated economy (monoecconomy)**

*Source:* developed by the authors

The advantage of the actual lack of diversification is the ability to concentrate efforts on the development of one type of activity and the region’s economy to gain competitive advantages that others cannot achieve due to the ability to concentrate resources. However, it should be borne in mind that if the leading type of economic activity is low-tech, then its

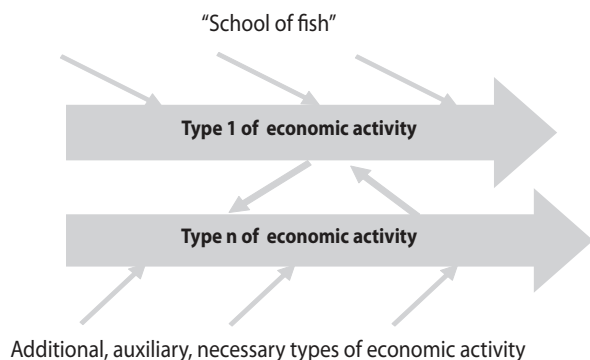
development according to the extensive type is limited and will eventually begin to slow down, and the region (country) will enter a phase of stagnation.

The main disadvantage of mono-sectoral development is its critical dependence on the availability of the main resource used, access to the market, especially the world market, and the level of competition. Any fluctuations or crises that affect these basic requirements of a mono-sector region can have catastrophic consequences for its economy, population and functional capacity.

That is why even countries that have relied on oil production for some time and have large reserves of raw materials are increasingly developing other activities, mostly related to financial and insurance services.

2. A medium-concentrated economy is characterized by approximately the same degree of development of several, but a small number, types of economic activity. These types of activity are interconnected by production and technological links, and the corresponding enterprises are included in several value chains. As in the first type, the remaining types of economic activity are present in the required volume and do not have significant development resources.

Schematically, the medium-concentrated type is presented in Fig. 2 and is conventionally called a "School of fish", which reflects, firstly, the presence of several developed types of activity, and secondly, the presence of connections between them. This type is closed to the concept of related diversification. For example, such a type can be formed in the presence of highly developed agriculture and a subsector of the food industry, which specializes in the processing of the corresponding raw materials. Another example is the combination of mining of metallic minerals and metallurgical production.



**Fig. 2. Spatial development scheme of a medium-concentrated economy**

Source: developed by the authors

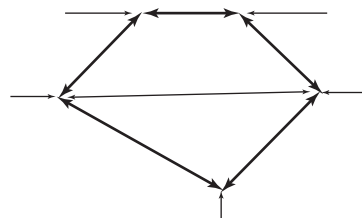
The products of a region with a medium-concentrated type of diversification are more diversified due to the possibility of exporting at each link of the value chain outside the region and, partially, outside the country. Thus, the export component of economic diversification is expanded compared to the first type. In addition, if related types of economic activity represent links of the value chain, then part of the products of the region (country) has a higher technological level, and therefore its export has greater advantages.

The advantages of the medium-concentrated type of diversification are the possibility of creating full-cycle value chains, which increases the competitiveness of both the region and economic entities. This advantage can be fully used in the case when the final links of the value chain are high-tech production. Therefore, a more detailed division of this type is possible depending on the degree of technological sophistication of production: low-, medium- and high-tech medium-concentrated spatial development.

The disadvantages of a medium-concentrated economy are related to the fact that products are related, within the same chain, and therefore fluctuations in markets, negative impacts of natural origin, changes in the conditions of economic activity are reflected in the entire chain and violate its stability. In addition, the use and attraction of resources must be balanced, otherwise the medium-concentrated type of economic diversification risks turning into a highly concentrated one, when investment, human and organizational resources will be attracted to the production of one type, and not to the rest, which will lead to their decline. Strategic planning of the spatial development of a medium-concentrated economy requires careful analysis and coordination of the interests of all stakeholders.

3. The medium-diversified type of spatial development assumes that in the economy of a country, region, community, approximately the same share according to different characteristics (indicators) is occupied by several, a considerable number, types of economic activity that are closely related to each other. These types form the core of the country's (region's) economy, the rest are auxiliary (Fig. 3). In the medium-diversified type, it is the enterprises belonging to the core that provide the lion's share of employment, gross domestic (regional) product, export opportunities and budget revenues. This assumes the presence of an extensive network of production, technological, and logistical connections.

A diversified core may include a large number of value chains that form a complex network, or consist of a large number of parts of such chains, the remaining links of which are located outside the region, the country. The most attractive option is one in which those links of the chains that produce the greatest added value are concentrated in the country, the region. At the same time, a balance must be maintained between the real sector of the economy and other sectors.



**Fig. 3. Spatial development scheme of a medium diversified economy**

Source: developed by the authors

The advantages of a moderately diversified economy are greater stability in times of crisis, negative impacts, and fluctuations in global or domestic markets. Due to a greater

variety of activities, a more balanced labor market structure is ensured, stable local budget revenues, export opportunities, and the investment attractiveness of the region and country is enhanced.

Supporting this type of spatial development requires careful forecasting and strategic planning, coordinated economic policy at the central and local government levels. The competitiveness of territories with moderately diversified spatial development can be high provided that other types of economic activity that meet the needs of the population and business are also sufficiently developed and do not provoke unnecessary costs.

4. Highly diversified spatial development assumes that the economy of the region, the country is balanced, includes proportionally developed almost all types of economic activity (except for those associated with the presence of natural conditions or resources), between which a complex network of relationships of various nature has formed. The closest research concept to this type is "unrelated diversification". Schematically, this type is shown in Fig. 4.

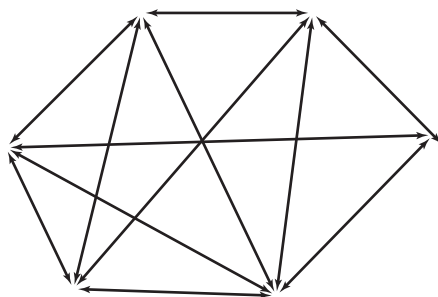


Fig. 4. Scheme of spatial development of a highly diversified economy

Source: developed by the authors

In a highly diversified economy, a large number of full-cycle value chains can form, which creates opportunities for the export of products with high added value. However, if each type of economic activity is presented fragmentarily, then the economy will not have such a balance, but on the contrary, its dependence on the external environment (in the broad sense) increases and poses a threat.

The advantages of a highly diversified economy are the same as those of a medium-diversified one, but to a greater extent. The main one is resistance to crisis influences. However, the stability and resilience of the economy also depends on the degree of development and technological sophistication of each type of economic activity.

A technologically weak highly diversified economy risks gradually losing its advantage due to the inability to meet domestic needs and exports. This means that not every country or region can achieve such a level of diversification, but only one that is able to maintain a high intensity of investment and innovation activity, has a large population, and a certain independence from imported supplies of basic resources and products.

Types of spatial development in the geographical dimension generally repeat the logic of typification in the

sectoral dimension. Four types are distinguished depending on the concentration of various resources.

Monoregional type of spatial development means an extremely high concentration of all types of economic activity, resources, and possibly population in one region – the center. Most often, this is the capital region, but not necessarily.

The analysis conducted showed that in Ukraine the effect of the capital is manifested very significantly in many indicators and types of economic activity. The share of the capital in certain types of activity is too high, but in some cases, several regions, including the capital, have approximately the same shares, which speaks against identifying the type of spatial development of Ukraine as monoregional.

Medium-concentrated development assumes that a small number of regions provide approximately the same contributions to the country's economy, and in aggregate their share reaches much more than half.

A diversified core includes several regions that may not be geographically adjacent, but are connected by technological and production ties, which are implemented through transport, logistics and telecommunications.

A diversified network assumes that the contribution of each region is approximately the same with weak specialization in types of economic activity. Like monoregional, this type of development is rather ideal, unattainable.

Summing up the proposed typology, we note that each of the types has its advantages and disadvantages. The general trend is that more diversified in geographical and sectoral terms, the economies of countries are more resistant to external shocks, but supporting their type of development requires more resources and a coordinated economic policy.

For the completeness of the developed typology, it is necessary to determine the boundaries of attributing certain regions to one of the types of diversification. Given the structural diversity of the economies of the world, it is impractical to develop uniform criteria for all countries. It is possible to develop a uniform system of criteria for a certain group of countries that are similar in scale, territory, natural resources and geographical indicators.

It should also be noted that the proposed typology is not fully suitable for analysis at the community level. In particular, rural communities usually have a mono-sector highly concentrated type of development, less often medium-concentrated. Urban communities are in a more advantageous position regarding diversification and the possibility of its strengthening. At the same time, given the trend of peri-urbanization, transitional rural regions already have both reserves and organizational capabilities for diversification of development.

At the first stage, we examined the distribution of individual types of economic activity of the real sector in the selected countries.

The total territory of Poland at the NUTS 2 level is divided into 17 units (regions). In general, employed people over 15 years of age are unevenly distributed across the country's regions. In particular, 11.3 % of total employment in the country is concentrated in the Śląskie Voivodeship, while 2.45 % is concentrated in the Opolskie Voivodeship. The coefficient of variation of the indicator is 47.2%, which confirms the heterogeneity of the distribution of employed people.

53.6 % of employment in the mining industry and quarrying is concentrated in the Śląskie Voivodeship, followed by Dolnośląskie, which employs 17.4 % of all employees in enterprises of this type of activity, which in total makes up 71.0 % of employees in the industry. The largest shares of employment in the manufacturing industry are in the Śląskie and Wielkopolskie Voivodeships and are 13.4 % and 13.0 %, respectively; in construction – in the Warszawski stołeczny region (11.2 %), Śląskie (11.1 %), Wielkopolskie (11.0 %), Małopolskie (10.8 %) Voivodeships; in the transportation and storage – in the Warszawski stołeczny region (14.7 %), Wielkopolskie (12.8 %) and Śląskie Voivodeships (10.8 %).

The territory of Romania consists of 8 regions defined at NUTS 2 level. The overall distribution of employed persons is homogeneous (the coefficient of variation is 22.4 %). The largest number of employed persons is concentrated in the Nord-East region – 16.3 %.

26.3 % of the employment in the mining and quarrying industry is concentrated in the Sud-Vest Oltenia region, followed by Centru region, which employs 18.0 % of all employees in this type of activity in the country. In the manufacturing industry, the largest shares of employment are in the Centru and Nord-Vest regions, accounting for 18.1 % and 16.2 %, respectively. In the construction sector, the largest share of employment is in the București-Ilfov region, with 24.0 %, followed by Nord-Vest region, with 15.9 %, while in the transportation and storage sector, the leaders are București-Ilfov, with 22.4 % and Nord-Vest region, with 14.7 %.

According to the Nomenclature of Territorial Units for Statistics of the European Union, the total territory of France at the NUTS 2 level is divided into 27 regions. The distribution of employment in the country is also heterogeneous, which confirms the value of the coefficient of variation, which is 106.5%. 20.1% of employment is concentrated in the Ile de France region, in second place in this indicator is the Rhône-Alpes region with a value of 10.6%.

In the Ile-de-France region, the share of employment in mining and quarrying industries is 9.6% of employment in this sector in the country, in second place in this indicator is the Rhône-Alpes region - 9.3%, in third - Aquitaine with 7.3%. The largest number of employment in the manufacturing industry is also in the Rhône-Alpes regions – 13.3% and Ile de France – 12.2% of the total number of employment in the sector of the country. Two regions also lead in construction: Ile de France – 19.1%, Rhône-Alpes – 11.1%. In the transportation and storage sector – Ile de France (27.0%).

The number of NUTS 2 regions in the Czech Republic is 8 units. The distribution of employment is the most homogeneous in comparison with the other studied countries (the coefficient of variation is 15.7%). The highest share of employment among the total number of employees in the country is in the South-Eastern Czech Republic region and is 16.0%.

The mining and quarrying industry is concentrated in the Severozápad region, where 38.8% of employees in enterprises of this type of economic activity among those employed in the country's industry are employed, and Moravskoslezsko region – 22.9%. As for the manufacturing industry, the maximum values of the indicator are in the Severovýchod region – 17.5% and Jihovýchod – 16.7%. In the construction industry, the largest

shares of employment are also in the regions of Praha – 20.4% and Jihovýchod – 17.3. In transportation and storage sector, the leaders in terms of the share of employment are the Praha region (20.5%) and Střední Čechy (16.0%).

To achieve the goal of our research, we calculated three indicators, the advantages of using which are substantiated, in particular, in work [20]: the Herfindahl-Hirschman index, the relative concentration index, the coefficient of regional and sectoral concentration. To quantify concentration, the Herfindahl-Hirschman index was calculated for each type of economic activity  $j$  [20]:

$$HHI_j = \sum_{i=1}^n S_{ij}^2,$$

where  $S_i$  – is the share of employees in enterprises of the  $j$ -th type of economic activity of the  $i$ -th region in the total number of employees in the country in this type of economic activity;

$n$  – is the number of regions of the country.

The value ranges from  $1/n$  to 1, where the minimum value corresponds to the case in which all industries have the same share; its increase indicates a higher level of concentration and, therefore, a lower level of diversification of the type of economic activity across regions of the country.

The Herfindahl-Hirschman index was obtained based on calculations on 2022 data for Poland, Romania, France and the Czech Republic for each type of economic activity presented in Figure 5.

The data presented in the figures demonstrate that for Poland the highest index values correspond to the mining and quarrying, for the remaining countries – to the type of economic activity in information and communication.

For a more detailed analysis of the differences in the economic component of spatial development of the selected countries, the relative concentration index was calculated for each type of economic activity  $j$  [20]:

$$L_j = \frac{1}{2} \sum_{i=1}^n \left| \frac{Y_{ij}}{Y_j} - \frac{Y_i}{Y} \right|,$$

where  $Y_{ij}$  – the number of employees at enterprises of the  $j$ -th type of economic activity of the  $i$ -th region in the total number of employees in the country in this type of economic activity;

$Y_i$  – the total number of employees in the  $i$ -th region;

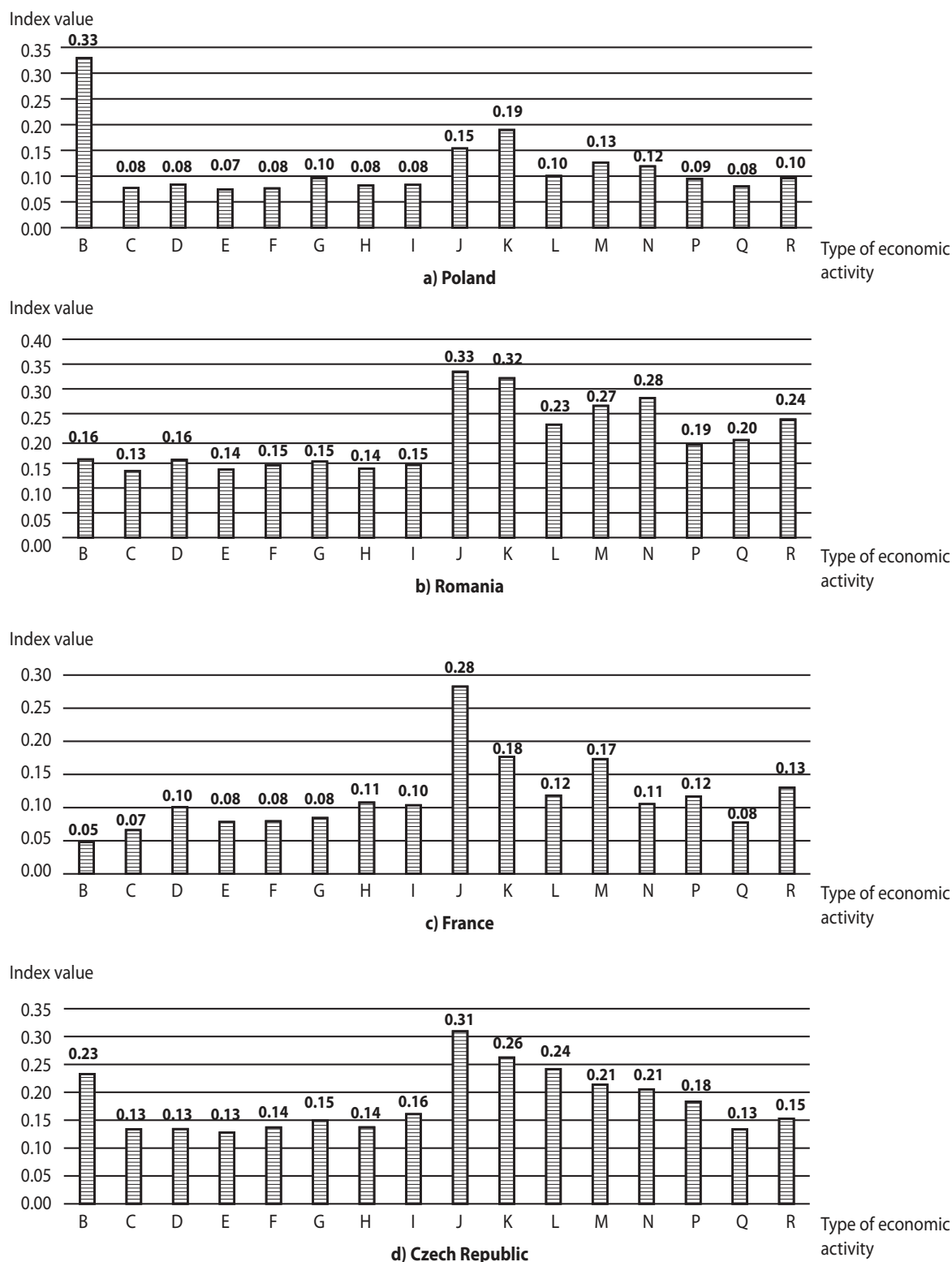
$Y_j$  – the total number of employees in the  $j$ -th sector in the country;

$Y$  – the total number of employees in the country.

$n$  – the number of regions of the country.

The index takes values in the range from 0 to 1 and measures the difference for all regions between their participation in total employment of the type of economic activity  $j$  and the share of their employment in total employment of the country. Accordingly, if the index equal to 0, this indicates that the share of employment in industry  $j$  in region  $i$  is equal to the share of employment in industry  $j$  in total employment, and therefore, there is no regional concentration of industry  $j$ . The obtained index values for the studied countries are presented in Table 1.

Thus, based on the index values, we can conclude that Poland, Romania and the Czech Republic are characterized by



Notes: B – Mining and quarrying; C – Manufacturing; D – Electricity, gas, steam and air conditioning supply; E – Water supply; sewerage, waste management and remediation activities; F – Construction; G – Wholesale and retail trade; repair of motor vehicles and motorcycles; H – Transportation and storage; I – Accommodation and food service activities; J – Information and communication; K – Financial and insurance activities; L – Real estate activities; M – Professional, scientific and technical activities; N – Administrative and support service activities; P – Education; Q – Human health and social work activities; R – Arts, entertainment and recreation.

Fig. 5. Herfindahl-Hirschman index values by type of economic activity

Source: developed by the authors based on their own calculations

Table 1

## Relative concentration index, 2022

| Country        | Type of economic activity |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|----------------|---------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|                | B                         | C    | D    | E    | F    | G    | H    | I    | J    | K    | L    | M    | N    | P    | Q    | R    |
| Poland         | 0.52                      | 0.09 | 0.10 | 0.07 | 0.41 | 0.15 | 0.09 | 0.13 | 0.31 | 0.30 | 0.14 | 0.22 | 0.20 | 0.12 | 0.08 | 0.14 |
| Romania        | 0.50                      | 0.27 | 0.25 | 0.10 | 0.11 | 0.13 | 0.10 | 0.14 | 0.41 | 0.38 | 0.27 | 0.32 | 0.34 | 0.20 | 0.22 | 0.28 |
| France         | 0.14*                     | 0.14 | 0.12 | 0.06 | 0.04 | 0.03 | 0.08 | 0.10 | 0.31 | 0.19 | 0.12 | 0.19 | 0.08 | 0.12 | 0.08 | 0.13 |
| Czech Republic | 0.41                      | 0.09 | 0.14 | 0.05 | 0.08 | 0.12 | 0.10 | 0.16 | 0.41 | 0.33 | 0.31 | 0.26 | 0.26 | 0.21 | 0.11 | 0.14 |

\* the value has a slight error due to the lack of data for individual regions

Source: calculated by the authors

a significant concentration of employment in the mining and quarrying industry, while in the Czech Republic its level is the same as for the information and communications sector. In France, the highest value was obtained for the information and communications sector. The variation of the index values can be compared on the basis of the statistical characteristics given in Table 2.

The regional and sectoral concentration coefficient was calculated to identify regional types according to the level of economic diversification [20]:

$$L_{ij} = \frac{Y_{ij} / Y_i}{Y_j / Y}, \quad i = 1, \dots, n; j = 1, \dots, r,$$

where  $r$  – number of types of economic activity.

Table 2

## Descriptive statistics of the relative concentration index

| Country        | Minimum value | Maximum value | Average | Median | Coefficient of variation |
|----------------|---------------|---------------|---------|--------|--------------------------|
| Poland         | 0.07          | 0.52          | 0.19    | 0.14   | 0.68                     |
| Romania        | 0.1           | 0.5           | 0.25    | 0.26   | 0.48                     |
| France         | 0.03          | 0.31          | 0.12    | 0.12   | 0.57                     |
| Czech Republic | 0.05          | 0.41          | 0.2     | 0.15   | 0.59                     |

Source: calculated by the authors

If the coefficient takes values greater than one ( $L_{ij} > 1$ ), we can speak of a greater specialization of the region in the type of economic activity  $j$  than the country and vice versa, if the value is less than one ( $L_{ij} < 1$ ).

The results of calculations for Poland based on data for 2022 are presented in Table 3.

According to the results of the calculations, the territorial units of Poland at the NUTS 2 level, in which only for one industry the coefficient takes values greater than one, are the Lubelskie Voivodeship, the Mazowieckie Voivodeship. For the Lubelskie Voivodeship, such an industry is the mining and quarrying (1.29), and for the Mazowieckie Voivodeship – transportation and storage activities (1.02). According to the proposed typology of spatial development, these regions can be classified as having a highly concentrated economy («Fish skeleton»). In the case of the Lubelskie Voivodeship, the development risk is dependence on resources and access to world markets due to the concentration of the economy on the mining and quarrying industry. As for the Mazowieckie Voivodeship, its location in the same voivodeship as the capital of the country has a positive impact on the overall socio-economic development of the region. In addition, routes of international importance pass through the region.

Territorial units in which only for a few industries (2-3) the coefficient takes values greater than one can be attributed to those with a medium-concentrated economy («School of fish»): Lubuskie, Opolskie, Kujawsko-Pomorskie Voivodeships – 3 types of activities each; Warmińsko-Mazurskie, Świętokrzyskie Voivodeships – 2 types of activities each. All of the listed regions have a higher concentration of employees in enterprises operating in the water supply; sewerage, waste management and remediation activities sector than in the country as a whole, and all, except Świętokrzyskie Voivodeship – in the manufacturing industry. In addition, the Opolskie and Świętokrzyskie Voivodeships have a higher concentration of people employed in the electricity, gas, steam and air conditioning supply, Lubuskie – in transportation and storage, Kuyavian-Pomeranian – in human health and social work activities.

The economies of the following regions can also be considered moderately concentrated: Dolnośląskie, Śląskie, Wielkopolskie, Zachodniopomorskie, Pomorskie, Łódzkie and Podkarpackie Voivodeships.

The only region in which all coefficient values for all types of economic activity are less than one is Podlaskie Voivodeship, which allows us to conclude that there are no industries in

Table 3

## Regional and sectoral concentration coefficient, Poland, 2022

| Region/<br>Voivodeship   | Type of economic activity |             |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
|--------------------------|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                          | B                         | C           | D           | E           | F           | G           | H           | I           | J           | K           | L           | M           | N           | P           | Q           | R           |
| Małopolskie              | 0.58                      | 0.93        | 0.77        | 0.97        | <b>1.24</b> | 0.95        | 0.88        | <b>1.42</b> | 1.76        | 0.78        | 0.97        | <b>1.37</b> | 0.89        | <b>1.08</b> | <b>1.14</b> | <b>1.33</b> |
| Śląskie                  | <b>4.75</b>               | <b>1.19</b> | <b>1.23</b> | <b>1.24</b> | 0.98        | 0.90        | 0.96        | 0.95        | 0.81        | 0.65        | 1.11        | 0.90        | 0.94        | 0.94        | <b>1.09</b> | <b>1.15</b> |
| Wielkopolskie            | 0.34                      | <b>1.35</b> | 0.80        | <b>1.03</b> | <b>1.14</b> | <b>1.77</b> | <b>1.32</b> | 0.84        | 0.75        | 0.68        | 0.91        | 0.91        | 0.92        | <b>1.09</b> | 0.89        | 0.89        |
| Zachodnio-<br>omorskie   | 0.11                      | 0.83        | <b>1.04</b> | <b>1.11</b> | 0.91        | 0.73        | <b>1.04</b> | <b>1.55</b> | 0.49        | 0.68        | <b>1.01</b> | 0.63        | 0.71        | 0.85        | 0.99        | 0.95        |
| Lubuskie                 | 0.13                      | <b>1.11</b> | 0.74        | <b>1.19</b> | 0.90        | 0.75        | <b>1.21</b> | 0.86        | 0.32        | 0.50        | 0.73        | 0.53        | 0.83        | 0.61        | 0.80        | 0.71        |
| Dolnośląskie             | <b>2.23</b>               | <b>1.08</b> | 0.85        | <b>1.14</b> | 0.92        | 0.86        | 0.88        | <b>1.16</b> | <b>1.29</b> | 0.82        | <b>1.06</b> | <b>1.16</b> | <b>1.32</b> | 0.98        | <b>1.12</b> | <b>1.11</b> |
| Opolskie                 | 0.31                      | <b>1.05</b> | <b>1.10</b> | <b>1.04</b> | 0.99        | 0.63        | 0.73        | 0.78        | 0.36        | 0.44        | 0.58        | 0.49        | 0.64        | 0.50        | 0.80        | 0.71        |
| Kujawsko-<br>Pomorskie   | 0.11                      | <b>1.06</b> | 0.85        | <b>1.07</b> | 0.91        | 0.80        | 0.78        | 0.75        | 0.52        | 0.62        | 0.80        | 0.60        | 0.65        | 0.88        | <b>1.01</b> | 0.88        |
| Warmińsko-<br>Mazurskie  | 0.14                      | <b>1.03</b> | 0.81        | <b>1.32</b> | 0.85        | 0.63        | 0.63        | 0.96        | 0.29        | 0.58        | 0.68        | 0.54        | 0.52        | 0.73        | 0.80        | 0.72        |
| Pomorskie                | 0.18                      | 0.96        | 0.86        | 0.88        | 1.13        | 0.77        | <b>1.00</b> | <b>1.28</b> | <b>1.19</b> | 0.94        | 1.10        | 1.03        | 0.85        | <b>1.08</b> | <b>1.04</b> | 0.94        |
| Łódzkie                  | 0.74                      | <b>1.08</b> | <b>1.07</b> | 0.81        | 0.79        | 0.94        | <b>1.00</b> | 0.75        | 0.60        | 0.92        | 0.86        | 0.75        | <b>1.20</b> | <b>1.04</b> | 0.85        | 0.83        |
| Świętokrzyskie           | 0.79                      | 0.90        | <b>1.05</b> | <b>1.03</b> | 0.91        | 0.73        | 0.71        | 0.77        | 0.27        | 0.38        | 0.59        | 0.51        | 0.57        | 0.59        | 0.95        | 0.62        |
| Lubelskie                | <b>1.29</b>               | 0.66        | 0.66        | 0.83        | 0.94        | 0.77        | 0.89        | 0.65        | 0.48        | 0.60        | 0.76        | 0.53        | 0.38        | 0.79        | 0.83        | 0.64        |
| Podkarpackie             | <b>0.17</b>               | <b>1.25</b> | <b>1.06</b> | 0.89        | <b>1.00</b> | 0.84        | 0.74        | 0.77        | 0.48        | 0.47        | 0.65        | 0.55        | 0.72        | 0.67        | 0.94        | 0.64        |
| Podlaskie                | 0.23                      | 0.79        | 0.89        | 0.77        | 0.82        | 0.73        | 0.84        | 0.65        | 0.45        | 0.51        | 0.68        | 0.52        | 0.44        | 0.70        | 0.82        | 0.57        |
| Warszawski<br>stołeczny  | 0.08                      | 0.67        | <b>1.67</b> | 0.84        | <b>1.13</b> | <b>1.73</b> | <b>1.48</b> | <b>1.43</b> | <b>3.12</b> | <b>4.01</b> | <b>2.16</b> | <b>2.74</b> | <b>2.63</b> | <b>1.99</b> | <b>1.41</b> | <b>1.90</b> |
| Mazowiecki<br>regionalny | 0.14                      | 0.83        | 0.94        | 0.86        | 0.89        | 0.72        | <b>1.02</b> | 0.55        | 0.22        | 0.42        | 0.49        | 0.47        | 0.47        | 0.63        | 0.66        | 0.55        |

Source: calculated by the authors

which the region has greater specialization than the country as a whole, and the type of its economy diversification is the same as for Poland's one.

There are no regions where there is greater specialization than in the country in all types of economic activity, but the Warszawski stołeczny region is closest to this characteristic (13 types of economic activity out of 16), i.e. it can be attributed to a highly diversified type of spatial development ("core"). However, it should be noted that among the types of economic activity, the highest level of concentration of employed people compared to the country as a whole is observed in financial and insurance activities, information and communication, as well as close high levels in the following sectors: real estate activities; professional, scientific and technical activities; administrative and support service activities; education. At the same time, the regional and sectoral concentration coefficient for the manufacturing industry is less than one, i.e. the share of employed people in this sector is lower than in the country as a whole. Most of the listed characteristics are generally inherent in the capital regions of countries, which are often considered and classified separately from the rest of the regions.

The latter type also includes the Dolnośląskie Voivodeship, in which 9 types of economic activity had a

coefficient value corresponding to specialization higher than in the country as a whole.

The same calculations were made for the regions of Romania (Table 4).

There are no regions in Romania that can be classified as having a highly concentrated economy ("Fish skeleton"), i.e. for only one industry the coefficient takes values greater than one.

Territorial units in which only for a few sectors (2-3) the coefficient takes values greater than one, and therefore can be attributed to those with a medium-concentrated economy ("School of fish"): Sud-Muntenia, Sud-Vest Oltenia, Vest. All these regions have a concentration of employment in the mining and quarrying sector. In Sud-Muntenia and Vest region, employment concentration is also observed in the manufacturing industry. For Sud-Vest Oltenia, concentration is characteristic in the electricity, gas, steam and air conditioning supply sector, and in the Vest region – in transportation and storage.

The Nord-Vest, Nord-Est and Sud-Est regions can also be attributed to medium-concentrated economies.

The Centru region can be classified as a moderately diversified economy ("core"), in which the values of the regional and sectoral concentration coefficient are greater than one for a significant number of economic activities:

Table 4

## Regional and sectoral concentration coefficient, Romania, 2022

| Region           | Type of economic activity |             |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
|------------------|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  | B                         | C           | D           | E           | F           | G           | H           | I           | J           | K           | L           | M           | N           | P           | Q           | R           |
| Nord-Vest        | 0.66                      | <b>1.15</b> | 0.60        | 0.81        | <b>1.11</b> | 0.89        | <b>1.03</b> | 0.94        | <b>1.13</b> | 0.91        | 0.44        | 0.73        | 0.63        | 0.69        | 0.71        | 0.79        |
| Centru           | <b>1.55</b>               | <b>1.56</b> | <b>1.70</b> | <b>1.00</b> | 0.96        | 0.95        | <b>1.00</b> | <b>1.22</b> | 0.58        | 0.55        | 0.70        | 0.75        | 0.74        | 0.89        | 0.88        | 0.92        |
| Nord-Est         | 0.40                      | 0.61        | 0.23        | 0.69        | 0.78        | 0.72        | 0.61        | 0.68        | 0.48        | 0.40        | 0.75        | 0.44        | 0.35        | 0.68        | 0.63        | 0.49        |
| Sud-Est          | 0.75                      | 0.82        | <b>1.11</b> | <b>1.34</b> | 0.97        | 0.94        | <b>1.09</b> | <b>1.20</b> | 0.25        | 0.53        | 0.30        | 0.60        | 0.65        | 0.83        | 0.74        | 0.74        |
| Sud-Muntenia     | <b>1.06</b>               | <b>1.01</b> | 0.70        | 0.89        | 0.81        | 0.78        | 0.84        | 0.61        | 0.18        | 0.41        | 0.44        | 0.57        | 0.56        | 0.74        | 0.59        | 0.50        |
| București-Ilfov  | 0.50                      | 0.75        | <b>1.54</b> | <b>1.43</b> | <b>1.60</b> | <b>1.83</b> | <b>1.48</b> | <b>1.62</b> | <b>3.57</b> | <b>3.54</b> | <b>3.81</b> | <b>3.14</b> | <b>3.27</b> | <b>2.35</b> | <b>2.48</b> | <b>2.89</b> |
| Sud-Vest Oltenia | <b>2.96</b>               | 0.84        | <b>1.82</b> | 0.93        | 0.77        | 0.81        | 0.82        | 0.76        | 0.25        | 0.52        | 0.14        | 0.53        | 0.66        | 0.65        | 0.83        | 0.60        |
| Vest             | <b>1.03</b>               | <b>1.54</b> | 0.72        | 0.97        | 0.83        | 0.94        | <b>1.16</b> | 0.94        | 0.91        | 0.50        | 0.59        | 0.79        | 0.73        | 0.89        | 0.91        | 0.67        |

Source: calculated by the authors

mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage, waste management and remediation activities; transportation and storage; temporary accommodation and catering; information and communication. Moreover, the values of the coefficient for mining and manufacturing, as well as the electricity, gas, steam and air conditioning supply, which can be accompanied by an extensive network of production, technological and logistical connections, are quite close to each other.

Just like in Poland, there are no regions where there is a greater specialization than in the country in all types of economic activity, the București-Ilfov region (14 types of economic activity out of 16), which can be attributed to a

highly diversified type of spatial development ("network"). Among the types of economic activity, the highest level of concentration of employed people compared to the country as a whole is observed in the information and communication sector, financial and insurance activities, real estate activities, professional, scientific and technical activities, administrative and support services activities. At the same time, the coefficient of regional and sectoral concentration not only for the mining and quarrying, but also for the manufacturing industry is less than one, i.e. the share of employed people in both these sectors is lower than in the country as a whole.

The results of the calculations for the regions of France at the NUTS 2 level are presented in Table 5.

Table 5

## Regional and sectoral concentration coefficient, France, 2022

| Region                | Type of economic activity |             |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
|-----------------------|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                       | B                         | C           | D           | E           | F           | G           | H           | I           | J           | K           | L           | M           | N           | P           | Q           | R           |
| 1                     | 2                         | 3           | 4           | 5           | 6           | 7           | 8           | 9           | 10          | 11          | 12          | 13          | 14          | 15          | 16          | 17          |
| Ile de France         | 0.48                      | 0.61        | <b>1.23</b> | 0.96        | 0.95        | <b>1.05</b> | <b>1.34</b> | <b>1.25</b> | <b>2.54</b> | <b>1.94</b> | <b>1.38</b> | <b>1.87</b> | <b>1.30</b> | <b>1.36</b> | <b>0.88</b> | <b>1.55</b> |
| Centre – Val de Loire | 0.81                      | <b>1.23</b> | <b>1.63</b> | <b>1.00</b> | 0.97        | 0.91        | 0.96        | 0.73        | 0.41        | 0.16        | 0.78        | 0.57        | <b>1.01</b> | 0.65        | 0.80        | 0.83        |
| Bourgogne             | <b>1.43</b>               | <b>1.22</b> | 0.59        | 0.97        | 0.94        | <b>1.01</b> | <b>1.01</b> | 0.80        | 0.28        | 0.07        | 0.72        | 0.59        | 0.87        | 0.70        | 0.94        | 0.78        |
| Franche-Comté         | <b>1.15</b>               | <b>1.53</b> | 0.46        | 0.68        | 0.79        | 0.82        | 0.65        | 0.59        | 0.22        | 0.05        | 0.69        | 0.54        | 0.73        | 0.59        | 0.71        | 0.64        |
| Basse-Normandie       | <b>1.15</b>               | <b>1.32</b> | <b>0.98</b> | <b>1.11</b> | <b>1.03</b> | <b>1.01</b> | 0.70        | 0.93        | 0.29        | 0.07        | 0.77        | 0.68        | 0.81        | 0.76        | 0.92        | <b>1.14</b> |
| Haute-Normandie       | -                         | <b>1.27</b> | -           | <b>1.11</b> | 0.97        | 0.86        | <b>1.22</b> | 0.70        | 0.31        | 0.10        | 0.89        | 0.62        | 0.91        | 0.69        | 0.83        | 0.78        |
| Nord-Pas de Calais    | -                         | <b>1.05</b> | -           | <b>1.23</b> | 0.89        | <b>1.01</b> | <b>1.02</b> | 0.80        | 0.67        | 0.25        | 0.80        | 0.73        | <b>1.08</b> | 0.83        | <b>1.01</b> | 0.73        |
| Picardie              | 0.90                      | <b>1.17</b> | 0.42        | 0.96        | 0.81        | 0.86        | 0.97        | 0.66        | 0.25        | 0.07        | 0.71        | 0.47        | 0.84        | 0.60        | 0.76        | 0.87        |
| Alsace                | <b>1.00</b>               | <b>1.34</b> | 0.75        | 0.71        | 0.94        | <b>1.00</b> | 0.88        | 0.97        | 0.52        | 0.12        | 0.72        | 0.68        | 0.92        | 0.76        | 0.84        | 0.64        |
| Champagne-Ardenne     | <b>1.57</b>               | <b>1.29</b> | <b>1.20</b> | 0.99        | 0.90        | 0.94        | 0.94        | 0.74        | 0.23        | 0.06        | 0.73        | 0.54        | 0.86        | 0.73        | 0.89        | 0.65        |
| Lorraine              | <b>1.21</b>               | <b>1.03</b> | <b>1.19</b> | <b>1.11</b> | 0.86        | 0.85        | 0.85        | 0.72        | 0.32        | 0.10        | 0.57        | 0.53        | 0.79        | 0.70        | 0.96        | 0.58        |
| Pays de la Loire      | -                         | <b>1.48</b> | -           | 0.93        | <b>1.10</b> | 0.98        | 0.91        | 0.79        | 0.83        | 0.28        | 0.88        | 0.83        | <b>1.06</b> | 0.90        | 0.86        | 0.94        |
| Bretagne              | <b>1.14</b>               | <b>1.21</b> | 0.49        | 0.84        | <b>1.06</b> | <b>1.00</b> | 0.86        | 0.95        | 0.75        | 0.19        | 0.81        | 0.73        | 0.92        | 0.82        | 0.88        | 0.77        |

End tbl. 5

| 1                          | 2            | 3           | 4           | 5           | 6           | 7           | 8           | 9           | 10          | 11    | 12          | 13          | 14          | 15          | 16          | 17          |
|----------------------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------|-------------|-------------|-------------|-------------|-------------|-------------|
| Aquitaine                  | <b>1.35</b>  | 0.86        | 0.85        | 0.84        | <b>1.09</b> | <b>1.03</b> | 0.85        | <b>1.06</b> | 0.69        | 0.23  | <b>1.05</b> | 0.83        | 0.88        | 0.97        | <b>1.19</b> | 0.90        |
| Limousin                   | <b>2.03</b>  | <b>1.08</b> | 0.93        | 0.90        | 0.96        | 0.96        | 0.93        | 0.75        | 0.27        | 0.03  | 0.78        | 0.54        | 0.73        | 0.75        | 0.97        | 0.58        |
| Poitou-Charentes           | <b>1.90</b>  | <b>1.17</b> | 0.84        | 0.96        | <b>1.06</b> | <b>1.04</b> | 0.75        | 0.92        | 0.39        | 0.15  | 0.79        | 0.60        | 0.86        | 0.77        | 0.98        | 0.91        |
| Languedoc-Roussillon       | <b>1.21</b>  | 0.57        | 0.65        | <b>1.18</b> | <b>1.06</b> | <b>1.08</b> | 0.77        | <b>1.20</b> | 0.59        | 0.13  | <b>1.11</b> | 0.78        | 0.75        | <b>1.05</b> | <b>1.39</b> | <b>1.06</b> |
| Midi-Pyrénées              | <b>1.32</b>  | 0.98        | 0.99        | 0.84        | 1.00        | 0.92        | 0.79        | 0.81        | <b>1.00</b> | 0.16  | 0.83        | 1.09        | 0.82        | 1.03        | 1.14        | 0.75        |
| Auvergne                   | <b>1.08</b>  | <b>1.31</b> | 0.76        | 0.76        | 0.97        | 0.93        | 0.81        | 0.80        | 0.38        | 0.06  | 0.66        | 0.62        | 0.71        | 0.65        | 0.88        | 0.74        |
| Rhône-Alpes                | 0.88         | <b>1.26</b> | <b>1.39</b> | 0.97        | <b>1.05</b> | 0.97        | 0.93        | 0.99        | 0.87        | 0.40  | <b>1.08</b> | <b>1.06</b> | 0.99        | <b>1.24</b> | 0.95        | 0.88        |
| Provence-Alpes-Côte d'Azur | 0.91         | 0.69        | 0.92        | <b>1.21</b> | <b>1.14</b> | <b>1.15</b> | <b>1.07</b> | <b>1.46</b> | 0.80        | 0.29  | <b>1.37</b> | <b>1.01</b> | <b>1.10</b> | <b>1.22</b> | <b>1.53</b> | <b>1.24</b> |
| Corse                      | -            | 0.45        | -           | 0.99        | 1.72        | 1.27        | 0.99        | 2.25        | 0.32        | 0.01  | <b>1.04</b> | 0.65        | 0.64        | 0.60        | <b>1.42</b> | 0.99        |
| Guadeloupe                 | -            | 0.61        | <b>1.21</b> | <b>2.16</b> | <b>1.00</b> | <b>1.13</b> | <b>1.03</b> | <b>1.06</b> | 0.52        | 0.02  | -           | 0.65        | 0.94        | <b>1.02</b> | <b>1.45</b> | 0.74        |
| Martinique                 | -            | 0.55        | -           | <b>1.93</b> | 0.82        | 0.97        | <b>1.03</b> | <b>1.02</b> | 0.44        | 0.02  | 0.74        | 0.59        | <b>1.03</b> | 0.64        | 1.10        | 0.71        |
| Guyane                     | <b>11.67</b> | 0.48        | <b>1.54</b> | <b>1.10</b> | 0.93        | 0.70        | 0.81        | 0.60        | 0.26        | 0.004 | 0.52        | 0.47        | <b>1.02</b> | 0.68        | 0.68        | 0.34        |
| La Réunion                 | <b>1.33</b>  | 0.63        | 0.63        | <b>1.82</b> | <b>1.15</b> | <b>1.12</b> | 0.97        | <b>1.02</b> | 0.43        | 0.03  | 0.85        | 0.67        | 0.86        | <b>1.21</b> | <b>1.65</b> | <b>1.10</b> |
| Mayotte                    | -            | -           | -           | -           | -           | -           | -           | -           | -           | -     | -           | -           | -           | -           | -           | -           |

«-» indicator values were not calculated due to the lack of initial data in the Eurostat database

Source: calculated by the authors

The table shows that Picardie can be attributed to the regions of France with a highly concentrated economy ("Fish skeleton"), where only one value of the coefficient of regional and sectoral concentration – for the manufacturing industry – is greater than one, and therefore we can speak of a greater specialization of the region in this type of economic activity than the country as a whole. Considering that this enlarged sector may include enterprises producing a wide range of products – from food to mechanical engineering, furniture, etc., the risks associated with dependence on the availability of a single resource are unlikely. In addition, it is in the manufacturing industry that high-tech production can be concentrated. However, final conclusions are possible subject to research into the subsectors of the manufacturing industry.

The medium-concentrated economy ("School of fish") includes the regions of Franche-Comté, Limousin, Auvergne with a higher concentration of employees in the mining and manufacturing industries than in the country as a whole, as well as the region of Corse (island), where employees are concentrated in the field of real estate activities, human health and social work activities. This type also includes regions such as Haute-Normandie, Alsace, Champagne-Ardenne and Pays de la Loire.

To the medium-diversified type ("core"): Centre – Val de Loire, Bourgogne, Basse-Normandie, Nord-Pas de Calais, Lorraine, Bretagne, Aquitaine, Poitou-Charentes, Midi-Pyrénées, as well as the overseas territories – Guadeloupe, Guiana and La Réunion, which, although they have similar values, require separate study. As in the cases of the previous countries, the metropolitan region of Ile de France (11 types of economic activity out of 16), i.e. can be attributed to the highly diversified type of spatial development («core»), as well as the region of Provence-Alpes-Côte d'Azur with the same number of types of economic activity. The mining and manufacturing

industries in both cases are not included in the list of these sectors. In addition, Languedoc-Roussillon with nine types of economic activity.

The results of the calculations for the regions of the Czech Republic are given in Table 6.

According to the proposed typology, the Severovýchod region can be classified as a region with a highly concentrated economy. Since the type of economic activity in which sectoral concentration takes place in this region is the manufacturing industry, then, taking into account its specifics, we can speak of a low level of risks inherent in this type and associated with dependence on the availability of the main resource and access to the market. The range of auxiliary activities can be quite wide, and therefore capable of ensuring a high level of employment in the region. However, for final conclusions, it is necessary to study the structure of the manufacturing, including from the point of view of its level of technological development.

Another region with a highly concentrated economy is Central Bohemia, where there is a high concentration of employment in Transportation and storage activities, which is explained by the geographical location of the country's capital (Praha) within this region, which performs logistics functions.

The medium-concentrated economy of the Jihovýchod, Jihozápad regions and Střední Morava has the manufacturing industry among the sectors in which the employed are concentrated.

According to the criteria used, Moravskoslezsko can be considered a region with a medium-diversified economy, however, special attention is required by the risks associated with a significant level of concentration in the mining and quarrying sector and maintaining a balance between the real and other sectors of the economy.

The Praha region, like the capital regions of the countries considered above, has a higher concentration in 14 out of 16

Table 6

## Regional and sectoral concentration coefficient, Czech Republic, 2022

| Region           | Type of economic activity |             |             |             |             |             |             |             |             |             |             |             |             |             |             |             |
|------------------|---------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                  | B                         | C           | D           | E           | F           | G           | H           | I           | J           | K           | L           | M           | N           | P           | Q           | R           |
| Praha            | 0.14                      | 0.54        | <b>1.25</b> | <b>1.20</b> | <b>1.53</b> | <b>1.94</b> | <b>1.54</b> | <b>2.23</b> | <b>3.80</b> | <b>3.50</b> | <b>3.30</b> | <b>2.97</b> | <b>2.90</b> | <b>2.59</b> | <b>1.56</b> | <b>2.04</b> |
| Střední Čechy    | 0.46                      | 0.93        | 0.61        | 0.84        | 0.81        | 0.94        | <b>1.21</b> | 0.64        | 0.35        | 0.34        | 0.60        | 0.64        | 0.59        | 0.77        | 0.81        | 0.97        |
| Jihozápad        | 0.64                      | <b>1.08</b> | <b>1.48</b> | 0.91        | 0.91        | 0.79        | 0.96        | 0.87        | 0.38        | 0.61        | 0.58        | 0.68        | 0.88        | 0.65        | 0.80        | 0.86        |
| Severozápad      | <b>3.86</b>               | 0.85        | <b>1.15</b> | <b>1.10</b> | 0.87        | 0.65        | 0.78        | 0.93        | 0.29        | 0.47        | 0.54        | 0.48        | 0.54        | 0.57        | <b>1.03</b> | 0.77        |
| Severovýchod     | 0.72                      | <b>1.27</b> | 0.81        | 0.97        | 0.92        | 0.81        | 0.82        | 0.80        | 0.43        | 0.78        | 0.55        | 0.67        | 0.60        | 0.69        | 0.81        | 0.87        |
| Jihovýchod       | 0.59                      | <b>1.05</b> | 0.86        | 0.91        | <b>1.08</b> | 0.98        | 0.88        | 0.88        | <b>1.23</b> | 0.77        | 0.84        | 0.93        | 0.72        | 0.83        | 0.79        | 0.82        |
| Střední Morava   | 0.31                      | <b>1.22</b> | 0.67        | <b>1.11</b> | 0.93        | 0.86        | 0.80        | 0.80        | 0.44        | 0.58        | 0.58        | 0.65        | 0.62        | 0.81        | <b>1.17</b> | 0.73        |
| Moravsko-slezsko | <b>2.13</b>               | <b>1.08</b> | <b>1.32</b> | <b>1.01</b> | 0.86        | 0.90        | 0.95        | 0.78        | 0.65        | 0.70        | 0.80        | 0.74        | <b>1.04</b> | 0.96        | <b>1.12</b> | 0.84        |

Source: calculated by the authors

types of economic activity, the exceptions being mining and manufacturing industries.

**Conclusions.** The analysis provides initial information on the diversification of the regions of the selected EU countries and the possibilities of using the proposed indicators. What all the countries considered have in common is that the most diversified economy is that of the capital region. Highly concentrated regional economies are mainly concentrated on mining and quarrying because of the distribution of resources, and on manufacturing. The first type is more vulnerable to fluctuations in world markets. It should be noted that the inclusion in the consideration of an enlarged type of economic activity, which covers agriculture, as well as the detailing of the processing industry, especially manufacturing, by its sub-sectors will allow expanding the possibilities for determining the types of regions at the next stages of the study. One of the directions of further research is analyzing dependencies between types of diversification and macroindicators.

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